Bank of Canada Banque du Canada

Working Paper 2001-10 / Document de travail 2001-10

The Future Prospects for National Financial Markets and Trading Centres

by

Charles Gaa, Stephen Lumpkin, Robert Ogrodnik, and Peter Thurlow

ISSN 1192-5434

Printed in Canada on recycled paper

Bank of Canada Working Paper 2001-10

June 2001

The Future Prospects for National Financial Markets and Trading Centres

by

Charles Gaa,[1] Stephen Lumpkin,[2] Robert Ogrodnik,[1] and Peter Thurlow[1]

[1]Financial Markets Department
Bank of Canada
Ottawa, Ontario, Canada K1A 0G9
CharlesGaa@bankofcanada.ca
rogrodnik@bankofcanada.ca
pthurlow@bankofcanada.ca

[2]Financial Affairs Division, OECD
Stephen.LUMPKIN@oecd.org

The views expressed in this paper are those of the authors.
No responsibility for them should be attributed to the Bank of Canada nor to the OECD.

Contents

Acknowledgements v
Abstract/Résumé vii

1. Introduction 1

2. Basic Types of Financial Markets 1

2.1 Fixed-income markets 1
2.2 Equity markets 2
2.3 Matching versus intermediated markets 3

3. Financial Market Location 4

3.1 Economic forces of consolidation 4
3.1.1 Search costs 4
3.1.2 Transportation costs 5
3.1.3 Economies of scale 5
3.1.4 Liquidity 5
3.2 Economic forces of segmentation and fragmentation 6
3.2.1 Information barriers 6
3.2.2 Illiquidity and small-country bias 7
3.2.3 Regulatory barriers 8
3.2.4 The primacy of sovereign debt 8
3.3 A domestic currency 8

4. Global Trends Affecting Financial Markets 9

4.1 Globalization 9
4.2 Institutionalization of savings 11
4.3 Technology 11
4.4 Disintermediation 15
4.5 Transparency 16
4.6 Alliances among stock exchanges 17

5. Operating Services: Custody, Clearing, and Settlement 18

5.1 Forces encouraging consolidation in operating services 18
5.1.1 Technological advances 19
5.1.2 Demographics and changes in investor behaviour 20
5.1.3 Globalization 21
5.1.4 Financial sector consolidation 22

5.2 Consolidation of market infrastructures 23

6. Issues 24

6.1 The efficiency, stability, and safety of future financial markets. 25

6.2 The viability of national financial markets 27

6.3 Effects of consolidating clearing and settlement 28

6.4 Policy recommendations 30

7. Conclusions 31

References 32

Tables 33

Figure 36

Acknowledgements

The authors owe a debt of gratitude to a great number of people, too many to mention, at the Bank of Canada and the OECD's Financial Market Committee for very useful discussions and comments. Of course, we are responsible for any remaining shortcomings.

101-05274/

Abstract

This paper investigates the effects of the continuation of globalization and technological developments on the future of national-level financial markets and trading centres, particularly in smaller countries such as Canada. We foresee the development of a single global market in the most-liquid assets based on equity-market linkages. Thus, we see this global market being accessed by national-level trading centres. Moreover, we see a remaining role for national-level intermediated markets for less-liquid products. This could pose some problems as the scale of the latter could diminish over time.

JEL classification: G10
Bank classification: Financial markets

Résumé

L'étude porte sur les effets de la poursuite de la mondialisation et du progrès technique sur l'avenir des centres d'échange d'actifs financiers et des marchés financiers nationaux, particulièrement pour des économies de petite taille comme le Canada. En raison des liens grandissants entre les marchés d'actions, les auteurs prévoient que les actifs hautement liquides se négocieront sur un marché mondial unique, dont l'accès se fera à partir de centres d'échange d'actifs financiers nationaux. Selon les auteurs, les produits peu liquides continueront de se négocier sur les marchés nationaux où il y a intermédiation. La baisse éventuelle du volume d'activité de ces marchés pourrait cependant devenir problématique.

Classification JEL : G10
Classification de la Banque : Marchés financiers

1. Introduction

Financial markets are a significant means by which savings, public or private, are transformed into productive investments. Efficient, well-functioning financial markets contribute to stable economic growth, and significant fluctuations in those markets can cause macroeconomic shocks. This is the primary reason why experts in monetary and fiscal policy have long been keenly interested in financial market developments. Technological advances, deregulation, and increasing competition are radically transforming financial markets in the OECD area. Technological change has vastly lowered information-handling and other transaction costs, creating the foundation for enormous and fundamental changes in the structure and functioning of financial markets as substantial new opportunities are opened up and exploited. To some degree, new developments have supported further consolidation and centralization of financial markets. The growing importance of global financial trading centres, along with increased use of the Internet and other electronic trading platforms, portend heightened competition for "national" financial markets, which raises questions about their long-run viability. It appears that the one certainty is that, as we move into the future, financial markets will resemble those in the past less and less.

This study examines the nature and effects of the current changes to financial markets on the future viability of national financial markets and the access to global financial markets from smaller countries. The paper first reviews the various financial markets. It then evaluates the net effect of developments, primarily technological, on various aspects of financial markets, which include their structure, their location, and their participants. Section 5 outlines back-office developments in the OECD area. Section 6 describes where these developments seem to be taking financial markets, and then discusses various issues that could be associated with the developments, as well as possible policy options and recommendations. Section 7 offers some conclusions.

Obviously, it is hazardous to predict the future, particularly when there is so much flux at present. The authors of this paper do not have any certainty of what the future could bring. They simply wish to stimulate debate.

2. Basic Types of Financial Markets

2.1 Fixed-income markets

Most fixed-income markets, which are dominated by the secondary market for government debt securities, have historically been decentralized and quote-driven. Until recently, transactions have

largely been arranged over-the-counter through telephone contacts. In many countries, at the core of the market are a relatively small number of large broker-dealers, who act as market-makers, offering to trade securities at bid and ask prices. This arrangement characterizes most markets in government securities, or (in the case of some smaller countries) through large syndicates of investment banks. These broker-dealers not only help to market a government's primary issues to investors but also maintain two-way markets in secondary trading. Secondary market activity tends to be driven by the investment activities of large institutional investors, who approach some or all of the dealers in series, obtaining quotes, and trading with the dealer who offers them the best price.[1] Institutional investors are also major participants in repo markets, either as direct counterparties or through the services of third-party custodians. This is the customer sphere of activity. Dealers also trade amongst themselves directly, or through interdealer brokers (IDB), often to neutralize or hedge the large positions that they take on in their trades with customers. This is the dealer sphere of activity. The separation of the two spheres is generally complete; that is, customers do not directly transact with other customers, although steps have been taken recently to establish electronic systems to provide for direct customer-to-customer trading in selected securities. In addition to risk-sharing, the interdealer market also facilitates the price discovery process for dealers.[2]

In most countries, the largest single issuer of debt securities is the government. Recently, however, a number of countries, notably Canada, the United States, and the United Kingdom, have entered a phase of declining government borrowing needs, and corporate borrowing has grown in relative importance. The decline in government borrowing has "crowded in" private sector borrowing in the form of corporate bonds, commercial paper, and asset-backed securities.

2.2 Equity markets

Equity markets are centralized for a number of reasons. One is to have a central exchange in a single physical location. Membership, or the ownership of one or more seats on the exchange, entitles members to have access to the exchange's trading facilities. A second reason is that centralization makes a significant amount of information publicly available on a consolidated basis. This can include both pre-trade information (bid and ask quotes) and post-trade information (data on completed trades in the market).

---

1. This is a heuristic characterization. In fact, this is changing as TradeWeb allows for contemporaneous contact with multiple dealers. These developments are discussed at greater length below.
2. The structure of foreign exchange markets is largely similar.

However, the structure of some equity markets is less-centralized and more fragmented than at first appears. In addition to having central exchanges, equity markets are a multiple-dealer market in which a limited number of dealers attempt to supply their customers with liquidity. When a dealer receives an order from a customer, before trading on the exchange the dealer may attempt to fill the order by cross-matching the orders of buying and selling customers, by drawing upon the (generally small) inventories of the firm, or by temporarily borrowing the securities from custodians. Examples of this type of market are the "upstairs" markets that operate alongside many stock exchanges, including the New York Stock Exchange (NYSE) and the Toronto Stock Exchange.

Many traditional exchanges have invested heavily in modern trading technology such that everything but the final order execution is automated. Moreover, a number of major exchanges have demutualized, and most others are expected to follow suit. In some cases, exchanges have merged with their derivatives counterparts, and many Continental European exchanges have vertically integrated their clearing and settlement platforms. Recently, in most regions there has been a spate of new ventures and strategic alliances between brokerages and alternative trading systems, as well as between various exchanges (Figure 1). Competition among traditional exchanges and alternative trading systems has increased markedly, both domestically and internationally, depending on the product traded.

2.3 Matching versus intermediated markets

Although there appear to be many variants and hybrids, financial markets seem to fall into one of two categories: matching or intermediated markets. In matching markets, security buyers and sellers search for and find each other, and subsequently conduct trades. There is some coordinating mechanism to facilitate the search and to create transparency (for example, a centralized trading floor, an order book, or a computer network). This type of system tends to be in place where there is more intrinsic liquidity; that is, where there are large numbers of buyers and sellers (that are not of grossly different sizes) and where standardized or commoditized products are traded. Many equity markets are based on the matching of trades. Intermediated markets are those in which an intermediary (market-maker) is ready to buy or sell securities, earning a return for their services from the bid-ask spread. This latter type of market occurs where there is less intrinsic liquidity; that is, there are fewer traders, trades tend to be large and choppy and more specialized, or illiquid products are traded. Most fixed-income and (although it is now changing) foreign exchange markets are based on intermediation.

3. Financial Market Location

The concept of the "location" or "nationality" of a financial market can be elusive. Obviously, there is little doubt where there is a floor trading system where most of the traders are of the same nationality, the products traded relate to that nationality, and the regulator is of the same nationality. However, the concept is less clear when the trading system is based on a computer network, and traders and products are of various nationalities. For example, most electronic trading systems could, in principle, accommodate trades from anywhere in the world. In this sense, some commentators suggest that financial markets are evaporating into cyberspace. However, physical markets still exist, and, perhaps more importantly, financial centres very much exist, with specific locations. It is probably more useful to examine the location of trading centres than of financial markets.

Financial centres are locations where major participants trade liquid benchmark products on relatively efficient markets and provide wholesale financial services to the rest of the economy. There are a number of critical elements in a trading centre, including market infrastructure, professional participants, and attractive financial products. Market infrastructure refers to the rules and customs that govern securities transactions and all associated businesses. This infrastructure is provided at relatively low cost. All trading centres attract professional participants, often including market-makers, who trade the financial products. Attractive products to trade are also necessary in financial centres. These include a full range of domestic products and often benchmark international products. In addition, the existence of a healthy, stable macroeconomy helps to generate a stable demand for financial services, as does a healthy regulatory environment.

3.1 Economic forces of consolidation

Why should trading centres, be they regional, national, or international, develop in the first place? They are such an integral part of our society that we may not think of this question. Yet, only by explicitly identifying the underlying factors, as obvious as they may seem, can we examine how trading centres are evolving at present.

3.1.1 Search costs

Those who wish to buy or sell securities must first find counterparties with whom to trade. The time and money that they must spend in doing so are called search costs. Search costs are reduced if potential buyers and sellers can agree to meet at a single geographic (or, more recently, notional)

location. The greater the number of market participants with which traders can interact, the better the chances of finding suitable counterparties quickly.

The desire to minimize search costs is a very good explanation for the existence of large centralized trading centres. In years past, after all, it was sometimes necessary to be in the physical presence of those with whom one wished to do business. To the extent that the minimization of search costs helps to explain the existence of centralized trading centres, they betray themselves as anachronisms.

3.1.2 Transportation costs

Ultimately, the demand for and the supply of savings is geographically widely dispersed. A trading centre's location is important in that its location may determine how far a market participant in a different location will have to go to get there. In the absence of transportation costs, we might expect to see the minimization of search costs followed to its logical extreme: a world with just one international trading centre. Given that transportation costs do exist, it would suggest some dispersion of financial markets. Moreover, it would be in the market participants' best interests if the trading centres were located in large urban areas with access to excellent transportation facilities. Notably, all major and most minor financial markets are so located.

3.1.3 Economies of scale

As the magnitude of trading and market activity in a trading centre increases, benefits accrue to market participants and to their operations. For example, financial intermediation is an industry that requires a skilled and specialized work force. An international trading centre attracts a large pool of suitable employees. Businesses that provide services to the financial sector (such as accounting, information technology, travel, and legal services) become more specialized and enjoy their own economies of scale as the centre grows. These benefits are passed on in the form of lower costs to the trading centre's customers—the market participants.

3.1.4 Liquidity

One final consideration is liquidity. Investors prize markets in which they can trade cheaply, quickly, and without large price reactions.[3] Liquid markets are more efficient than illiquid

3. Different groups of investors might have a preference for different attributes of exchanges and trading systems. For example, some traders prefer anonymity, while others prefer systems in which the identities of traders are fully disclosed. Some participants prefer to trade on continuous markets, while batch processing or periodic markets are sufficient for others. See the discussion in Lee (1998, Chapter 4).

markets, because prices reflect information more rapidly and reliably in liquid markets. Moreover, liquid markets are more stable than illiquid markets, because idiosyncratic trades of a given size have less of an effect on price in a liquid market. This creates a feedback effect, since participants will prefer to trade in markets that are liquid. As a market attracts participants by virtue of its liquidity, it becomes even more liquid, and therefore even more attractive to potential participants, and so on.

Competitive pressures and the desire to deepen liquidity have driven a number of stock markets to realign themselves so that each market can focus on certain niches, and thereby deepen the liquidity in those niches. This explains the realignments of the Canadian stock exchanges based in Vancouver, Montreal, and Toronto, the realignment of the Paris, Amsterdam, and Brussels bourses, and the realignment of the Madrid and Barcelona stock exchanges. However, these steps may be only stop-gap measures on the road to global interlinkage.

All of the factors examined here, except for transportation costs, seem to imply a certain momentum to the evolution of trading centres: a trend towards fewer and larger centres. Those that are large and liquid at the outset should continue to dominate, leaving little or no scope for regional or small national centres. Thus, to explain the profusion of small centres in the world, we must look to other factors.

3.2 Economic forces of segmentation and fragmentation

Section 3.1 explained some of the theoretical reasons why one might expect only very highly centralized global trading centres to exist. However, there is a further question: Why do regional and national trading centres continue to exist? The most obvious explanation is that this structure best serves the needs of market participants. But why is that the case?

In segmented markets, the rate of return to capital differs from the global rate of return. In short, free capital flows do not, or are not allowed to, equalize rates of return between countries. Unlike the framework that we presented in section 2.1, in the real world markets are not allowed to evolve according to the dictates of pure, cost-minimizing investor behaviour.

3.2.1 Information barriers

Differences in language, accounting standards, and incomplete knowledge regarding foreign investment opportunities dissuade investors from investing in foreign securities. At the most basic level, investors will be much more likely to invest in a company if they can read its financial statements. Nationals of a given country generally have superior knowledge about their own

markets and firms, just as the residents of other countries have superior knowledge about theirs. Since domestic investors are at a relative disadvantage as investors in foreign markets, they will consider foreign securities to be riskier, all else being equal, and will therefore require a higher risk premium. As a result, less will be allocated to the less-attractive foreign securities than would perhaps be optimal.

3.2.2 Illiquidity and small-country bias

When institutional investors consider various possible investments, the liquidity of a market is very important. They must be able to liquidate their holdings quickly, and without a severe price reaction. Moreover, when publicly listed companies decide which exchange(s) to list on, the liquidity of the market is very important. Small countries are at a disadvantage in this respect, while deep and liquid markets benefit greatly.

With respect to equity markets, internal fragmentation or "upstairs trading" occurs when an investment dealer matches customer orders internally within the firm, rather than on the central order book of the stock exchange. This practice stems from at least two factors. First, institutional trading has grown rapidly, reflecting the huge increase in the assets of mutual funds and pension plans. The trading of a large block of shares can have an adverse effect on price (from the perspective of the account) that far outweighs the fee cost of executing the transaction, particularly as the market becomes aware of a large offer to buy or sell. By internalizing the transaction, a large dealer can provide anonymity, and therefore eliminate much of the price risk, for the institutional investor. The second factor is that regulatory changes have permitted investment dealers to trade as principals and internalize orders. While this practice provides liquidity with anonymity, it does so at the expense of the liquidity of the central order book. It may also impair central price discovery, as not all buyers and sellers are included in the same process.[4]

Specific attributes of a country's financial markets, which may be directly or indirectly related to small size, can harm liquidity, and thereby dissuade foreign investment. Deficiencies in innovative financial products and in sophisticated credit-rating services are two possible results of small market size, and its consequent lack of liquidity. Another result might be the practice of issuing

4. A spirited debate has been ongoing in the United States regarding which of the two approaches provides customers with the "best execution." So-called "hard" central limit order books (preferred by large full-service dealers) mandate that all limit orders be displayed, subject to a first-come, first-served basis. "Soft" central limit order books provide for best execution as to price, but with no time constraints. This practice enables the dealer to cross some trades internally. In a system with strict price-time priority, this practice would not be allowed. Other variants enable dealers to withhold some orders, for example, by executing block trades.

corporate debt in the form of medium-term notes (i.e., small, frequent, and therefore extremely illiquid issues).

3.2.3 Regulatory barriers

Governments may erect regulatory barriers for a variety of reasons, some of which may be perfectly justified, but their effect is sometimes to either discourage foreign investment by domestic investors, or to discourage domestic investment by foreign investors. The result is a segmented financial market, with domestic savings over-allocated to domestic financial markets. In some cases this may be the original intent, as an intention may be to support the national market.

3.2.4 The primacy of sovereign debt

As the largest issuer of domestic currency debt securities, and as the ultimate source of regulatory authority, the government is often the most important player in the domestic fixed-income market. Therefore, another factor affecting location is that, all other things being equal, the government might prefer that the market be located domestically. To the extent that the government uses regulation to achieve this goal, this factor might be an example of a regulatory barrier.

The importance of government debt is related not only to its size, but to other measures of liquidity as well. Government securities are often the most frequently traded, and as the most-liquid fixed-income securities (and therefore presumably the most efficiently priced), their prices are the benchmarks against which other debt securities are compared.

3.3 A domestic currency

With respect to the continued existence of national financial markets, one should neither overlook nor underestimate the importance of having a separate currency. If a firm, government, or individual were to raise or invest funds in the domestic currency, the domestic financial market would be the "place to be" and there would be no foreign exchange risk for domestic issuers and investors. The market for the domestic currency, the critical mass and liquidity, and the issuer and investor base are all located in the home country. If the home country were to adopt a different currency, there would not necessarily be an inherent advantage in having the financial markets in the home country. Although the market can be lost due to inefficiency, there is a certain critical mass of domestic currency pay instruments in the home country simply because it is the home of the domestic currency. It will be interesting to observe and compare the development of financial markets in smaller European countries inside and outside of the euro area.

4. Global Trends Affecting Financial Markets

4.1 Globalization

Globalization refers to the increasing integration of nations' economies. Key elements include rising trade in goods and services, rapid dissemination of technologies, and rising cross-border capital flows. In this study, the term "globalization" refers to the reduction of market segmentation on a worldwide scale. Over the past number of years, investors have become much more savvy with respect to international financial markets. The value of international portfolio diversification has been fully incorporated into the collective consciousness. Also, English has become the official language of international finance, which makes the conduct of business easier for some, and more homogeneous in any case. Finally, while international accounting standards are not yet ironed out, certain conventions and disclosure requirements are becoming ubiquitous, and the exceptions are widely recognized.

Regulatory barriers are also coming down. Some countries have not had universally positive experiences with opening up their markets (particularly Asia and Latin America), but there seem to be no signs of backing down among the major industrial economies. Indeed, with the creation of the euro zone and the implementation of NAFTA, deregulation appears to be proceeding apace.

The globalization of financial markets goes hand-in-hand with the increasing primacy of a few international financial centres, although electronic trading systems may be altering the equation somewhat. Given the choice, investors of all nationalities will seek out the lowest-cost and most-liquid markets. The only way to stop them and preserve the importance of one's national market is to either make the market more attractive or deny investors the choice.

How might financial market participants react to this trend of globalized financial markets? First, consider the behaviour of domestic fixed-income investors. Even though it is now relatively simple for domestic retail investors to gain exposure to foreign bonds, they are not likely to move en masse into foreign debt securities in response, for instance, to the easing of foreign-content restrictions. Investors who desire foreign exposure tend to express this through equities. Similarly, foreign investors are unlikely to move into domestic fixed-income products as part of the globalization trend. The decision to invest in domestic debt is often largely a product of the interest rate spread and expected currency movements, with the latter potentially being the more important of the two.

In Canada and the European countries that are not part of the euro zone (for example, Sweden, Norway, Switzerland, and the United Kingdom), the behaviour of domestic corporate issuers

might be considered to be relatively sensitive to globalization, with a larger proportion of foreign (particularly U.S. dollar or euro) issuance by domestic firms being a likely scenario. As the domestic economy becomes more internationally linked, domestic firms may have increased incentives for foreign currency borrowing. This would be the case particularly where large foreign markets have greater capacity to absorb larger and more frequent issuances. International deregulation (such as NAFTA), better information flows (facilitated by, for example, the Internet), and continuing financial market innovation can only accelerate this trend.

Ultimately, issuers and investors, and not financial institutions, are the primary driving force behind the globalization of the financial intermediation process. National economies and major corporations are becoming increasingly global in orientation and more internationally interconnected. Corporations are seeking to align their capital or investor base to the location of their business activities. They want their stocks to be listed and traded in the countries in which most of their products are sold and in which their production activities are located, and where they are, therefore, most well-known. At the same time, investors are pursuing global diversification strategies to lower risk and enhance return. Similarly, technological advances—such as more rapid telecommunications and the development of electronic trading systems—are ultimately being driven by the demands of investors, small and large, for more instant access to information and for faster, cheaper execution of trades.

Both issuers and investors should benefit from the forces of globalization and technological advancement that are occurring in financial markets. Most obviously, large corporations with global orientations will have greater access to pools of capital internationally. Smaller companies should not, however, experience a diminution of service as a result of the trends that are impacting the industry. While complaints about shortages of venture capital, for example, are perennial (particularly by those who cannot find it), companies' access to the junior and senior domestic stock exchanges and bank loans should not be less than it was prior to globalization and the technological advancements in financial intermediation.

Company stocks will be interlisted or stock and derivative exchanges will be linked internationally, allowing investors to choose from a worldwide list of stocks and derivative products. Investors will be able to trade stocks and other products internationally as easily as they used to trade locally. With alternative trading systems, the potential exists for lower execution costs, greater investor anonymity, and enhanced market transparency. Trading hours will be extended, to perhaps as much as 24 hours per day, seven days per week.

Although there is a danger with alternative trading systems that markets could become more fragmented, particularly in the shorter term, in the long run there is the potential for markets to

become more liquid and for the price discovery process to become more transparent and fair as it is centralized electronically.[5] For these benefits to accrue to issuers and investors, domestic capital markets will need to adapt to global and technological developments so that they remain as or more efficient than larger, competitor markets.

4.2 Institutionalization of savings

Recent years have seen a marked increase in the institutionalization of savings, as the population ages and national "pay-as-you-go" pension programs lose their long-term credibility. In many countries recently, private pension funds and mutual funds have experienced very rapid growth. Another factor may be the increased knowledge of, and therefore heightened appetite for, markets and market exposure. Institutional investors are changing the landscape somewhat. One aspect, related to globalization, is that institutional investors are well aware of the risk-return benefits of a diversified international portfolio. Particularly in smaller markets, moves by large institutional investors can provoke significant price movements. The markets are simply not sufficiently liquid for this scale of investor. While any moves toward the globalization of markets that deepens liquidity will alleviate this situation, the institutional investors will support, with their business, more-liquid markets.

While full transparency of market information may not be appropriate for all markets and market segments, there is widespread agreement that improvements are needed, particularly in traditionally opaque fixed-income markets. Electronic trading systems have the potential to offer much greater transparency than is now available, and this may be an important factor in any future movement of trading to those systems.

4.3 Technology

The rapid pace of advances in computer and communications technology has had a dramatic effect on financial markets. The possible implications of electronic trading are important and far-reaching. The advent of electronic trading platforms has the potential to open a whole new dimension to the competition faced by regional and national trading centres, making previously

---

5. Trading systems differ in the nature of the price discovery process. Some exchanges (e.g., retail trading intermediaries offering a best-execution guarantee) compare prices from other exchanges and offer the best available price. An intermediate step draws orders from an electronic bulletin board, based on a point-and-click approach. More automated systems are auction trading systems that collect orders and execute them in intervals according to a specific turnover-maximizing principle (e.g., the Arizona Stock Exchange). Electronic communications networks, in contrast, provide for full dissemination of price information.

static markets and market activities much more mobile. Computer and communications technology is now such that market functions, even those within a particular firm, need not be physically close. The potential is that we will see individual activities migrating to separate locations based on comparative advantage.

In equity markets, the spread of "alternative trading systems" (ATSs) and electronic communications networks (ECNs) can be traced back to the mid 1990s, when regulatory changes in the United States authorized non-traditional players to set up trading platforms.[6] Initially, these systems were limited to institutional investors, broker-dealers, specialists, and other market professionals, but recent advances in information technology and telecommunications have placed ECNs within reach of the average retail investor. Technological advances have reduced the costs of establishing new trading systems, making it easier for new entrants to create new points of access to the market, while enabling the construction of novel types of trading systems. ATSs have also been constructed to respond to a demand from institutional investors, who are attracted to the lower trading costs and anonymity of ECNs but do not require the instant execution that exchanges normally provide. A few of the alternative exchanges are nearing sufficient trading volume to accommodate all but the largest block trades. ECNs in the United States account for an estimated 30 per cent of trading in securities listed on NASDAQ (see Table 1), and the forecasts call for on-line trading to capture nearly half of all NASDAQ retail equity trades as early as the end of 2000. In June 2000, three ECNs (Bloomberg Tradebook, BRUT, and MarketXT) agreed to join the electronic market that NASDAQ runs for trading exchange-listed stocks, which includes those listed on the NYSE.[7]

In Europe, ECNs still account for less than 5 per cent of the turnover of equity trading. However, while costs on the national exchanges have declined, they remain well above those on most ECNs, and many observers suggest that competitive pressures from ECNs are mounting rapidly. At the same time, other competitors are threatening to create pan-European trading systems of their own. As with other structural developments in the financial services sector in Europe, the single currency has been a major catalyst for change. With the elimination of currency barriers inside the

---

6. The Securities Exchange Commission's (SEC) Order Handling Rule of January 1997 resulted in a distinction between ECNs and so-called "crossing systems," which do not provide for ongoing dissemination of price information. To qualify as an ECN, a trading system must satisfy the following conditions: (i) continuous dissemination of price information, (ii) limit book management or ongoing auctions, and (iii) automatic matching of client orders and their execution. In addition, to gain access to the NASDAQ system, the operator must pledge to route the best market-maker orders that are available to NASDAQ, where they can be viewed and traded publicly.
7. Under the SEC's ATS regulation of November 1998, private trading systems have the choice of either registering as exchanges or meeting special requirements with respect to transparency and supervision.

euro zone, there is less benefit for companies to have their shares listed on different national exchanges, and many have begun to concentrate their stocks on fewer exchanges. On the customer side, institutional investors are increasingly replacing investment strategies based on currencies with a sector-based approach. One step in the direction of pan-European trading is the cross-border exchange created by the recent merger of the Paris, Amsterdam, and Brussels bourses to form Euronext. This step toward pan-European trading is based on the assumption that trading would be most efficient if it were concentrated in several large traditional exchanges (and perhaps eventually only one), with a vertically integrated clearing and settlement platform. The recent battle for the London Stock Exchange raises another possibility, involving competition among exchanges with an emphasis on cost-cutting and improved trading technologies, with clearing and settlement provided by a consolidated but separate system.

Electronic trading systems in fixed-income markets have not achieved quite the same success as those in equities or foreign exchange, but their use is growing rapidly. For example, the United States Bond Market Association's 1999 "Review of Electronic Transaction Systems" identified 68 such systems for institutional trading of bonds, compared with just 11 only three years earlier. The figures include five such systems that operate only in Europe.[8] Electronic trading of bonds by retail investors, mostly via the Internet, also appears to be growing rapidly. Much of the electronic trading in bonds has occurred in the relatively large markets of the United States and euro-zone sovereigns, but other types of fixed-income securities are also traded electronically, including federal agency securities, asset-backed and mortgage-backed securities, corporate bonds, money market instruments, and municipal bonds. Electronic trading in such instruments has been technically feasible for some time, but recent advances in computer software have made it easier to categorize and match the many types of bonds that issuers have outstanding, while other technological advances (e.g., open-architecture access) have made it easier to link different trading services. The Internet has been particularly noteworthy, enabling even small retail investors access to information flows that previously had been the sole province of broker-dealers and large institutional investors.

A variety of systems have been established recently to provide for fully electronic trading in fixed-income securities. Although each system in operation may have its own design characteristics,[9]

---

8. The largest of the European-based systems, in terms of volume of activity, is EuroMTS, which began operation in April 1999 as a pan-European interdealer electronic trading system for benchmark government bonds denominated in euros. EuroMTS works through the *Telematico* system developed by *Mercato dei Titoli di Stato*.

9. For example, the systems may be completely non-transparent regarding the identities of counterparties to other participants (e.g., EuroMTS, BrokerTec, and TradeWeb) or may provide some pre-trade and/or post-trade information (e.g., MTS Italy, Garban Intercapital). Some systems do not accept foreign participants.

the systems can be loosely placed in three major categories: auction systems, cross-matching systems, and dealer systems, which include single-dealer systems, multiple-dealer systems, and interdealer systems.

- **Auction systems:** As the name suggests, auction systems enable participants to bid directly on issues. Some auction systems are designed for new issues in the primary market. Many government borrowers have in place such systems, enabling dealers, institutional investors, and even in some cases retail investors to electronically place competitive and non-competitive bids for securities. Other issuers, including the World Bank, municipalities, and global corporations such as Ford, have recently tried their hand. Other auction systems are used by investors and others to place securities for sale in the secondary market. In both cases, details of the initial offering or securities for sale are posted in advance, and prospective bidders are also informed as to the auction format and award technique (first-price versus second-price).
- **Cross-matching systems:** Also called ECNs when there is ongoing dissemination of price information or, otherwise, ATSs, matching systems enable dealers and institutional investors to trade anonymously with multiple counterparties. Participants place buy or sell orders, and trades are executed automatically when a matching contra-order is entered at the same price or when posed prices are "hit." Order matching can be real-time or periodic. These types of systems are generally able to accommodate complex trading strategies that entail multiple orders placed for various securities. Consequently, these systems represent the greatest potential source of change to traditionally static fixed-income markets. In especially liquid markets, there is the potential (in theory) for dealers to be disintermediated.
- **Dealer systems:** Dealer systems allow customers to execute transactions directly with one or more dealers, but not with each other. They represent essentially a modernization of the old, decentralized, telephone-based system that prevails to this day, although there are certainly potential efficiency gains. There are three variants. *Single-dealer systems* allow investors to trade directly with a single dealer of choice, who acts as principal on all trades. The customer contacts the dealer, via the dealer's proprietary network, through third-party providers, or increasingly via the Internet, and obtains price quotes. The trade is executed if the quotes are deemed to be acceptable. These systems have been widely used by major fixed-income dealers (especially in the United States). *Multi-dealer systems* carry this concept one step further, allowing customers to examine quotes from two or more dealers simultaneously and to execute transactions as they see fit from among the multiple quotes. Some systems display the "best" bid or offer price for a given security among those placed by all participating dealers. These systems are used for trading in a variety of fixed-income securities, although mainly for trading in United States and European government securities. *Interdealer systems* restrict access to the dealer community, enabling dealers to execute transactions electronically with other dealers anonymously through the services of interdealer brokers. These systems have existed for some time as telephone-based systems, although they generally now operate as electronic platforms.

4.4 Disintermediation

The role of financial institutions in the capital intermediation process has changed significantly over the years. In the past, funds were intermediated through banks and other savings institutions. The savings of individuals were deposited in these institutions, which subsequently lent the funds as business and consumer loans. The advent of direct market financing for large borrowers, techniques such as securitization, and the institutionalization of savings has led to the disintermediation of financial institutions. In response to these forces, the largest banks have shifted into other lines of business. They have entered the securities business and have developed more sophisticated products such as over-the-counter or custom-designed derivatives.

As securities dealers, the largest banks serve both institutional investors and capital-raising corporate clients by providing access to information, advisory and analytic services, trading/ execution, market-making and liquidity, and sophisticated products like derivatives. However, even this paradigm is now shifting. For example, at one time dealers had the best direct access to the news services and could supply information and interpretation of market developments to their clients. With advancements in telecommunications, however, institutional investors and corporate treasuries also have direct and instantaneous access to this information. In fact, a large proportion of this information can now be obtained free over the Internet.

Similarly, with technological advances and the development of ATSs, securities execution is available from numerous sources, and the price of that service is being driven down relentlessly. Dealers already recognize that there is little money to be made and no long-term future in the simple execution of trades, a process that is readily amenable to automation. The electronic trading systems of the future may be owned independently by the investment dealers, or the exchanges may develop their own systems. What is certain, however, is that investment dealers will have to add value beyond execution through other services such as advice and analytics, and the design of derivative products.

It is particularly difficult to predict how the electronic trading platforms will play out in the shorter term. They have the capability to either fragment or centralize market liquidity, although given the underlying preference of institutional investors for centralized liquidity, there are clearly forces towards centralization over the longer term. Electronic trading platforms can affect not only regional but also global financial markets. For example, even NASDAQ and the NYSE are being affected by them. However, the development costs of these systems can be huge, which may give an advantage to larger markets and dealers. As stated earlier, however, as a commoditized

service, trade execution is becoming less and less important in the financial intermediation process, even though it is an essential element of intermediation.

Fixed-income markets everywhere rely heavily on dealers to intermediate. This is thought to be a product of both the heterogeneous nature of fixed-income securities and of the relatively large and infrequent nature of customer order flow. In terms of secondary market trading, the chance that two investors will happen to have matching requirements to buy and sell a certain security over any reasonable amount of time seems to be remote. In the primary market as well, dealers traditionally act as intermediaries between issuers and investors.

However, electronic trading systems have the potential to reduce the market's need for intermediary services. In large and liquid government securities markets, for instance, some customer orders could cross without the need for a market-maker's services. There is the prospect for some disintermediation among market-makers, in at least some market segments. Broker-dealers seem to be cognizant of this risk and are actively forming consortia to develop systems that would essentially compete with their own services. Disintermediation in this sense also implies some degree of centralization. The precise effects of such a fundamental shift in market structure are unknown, but one could easily imagine an improvement in liquidity as search costs fall.

4.5 Transparency

There is an increasing desire among investors for transparency. This is especially true for the traditionally opaque fixed-income markets. The trend towards institutionalization of savings, and the consequent shift in the balance of power towards institutional investors that this implies, has pushed the desire for transparency to the forefront. Electronic trading systems definitely have the potential to increase transparency. If this leads investors to feel more comfortable with trading, perhaps they will trade more frequently. This development would result in improved liquidity.

Some fixed-income market participants have, however, voiced concerns that transparency taken too far could harm liquidity. They argue that, in especially illiquid securities, market-makers would be less inclined to offer liquidity if other market participants were immediately apprised of the results of the trade. Anonymity of trading is also considered to be important by bond market participants.[10]

10. Moreover, recent research shows that transparency can inhibit liquidity because greater transparency obviates the need for interdealer trades to keep tabs on current market conditions. See Yang (2000).

4.6 Alliances among stock exchanges

The trend towards alliances among exchanges is well underway and is certain to continue. The goal is to provide firms that do business on a worldwide basis the opportunity to be listed on exchanges around the world. Just as many currencies are traded 24 hours per day, investors around the world will have the opportunity to trade the stocks of international companies after the home exchange of the company has closed.

There appear to be four different strategies for linking exchanges. The first is being developed by NASDAQ. They are creating markets in various countries with local partners using a common technology; for example, NASDAQ Europe, NASDAQ Japan, and NASDAQ Canada. Ultimately they will all be linked, creating a global electronic trading web. The second strategy is that of merger, as with the proposed (until recently) union of the London and Frankfurt stock exchanges. The large combined pool of liquidity would draw yet more trade from the continent. The third strategy is that of a hostile takeover bid, as was attempted by OM Gruppen of Sweden for the London Stock Exchange. The fourth strategy is being pursued by the NYSE in its creation of the Global Equity Market (GEM), which includes 10 other member exchanges. The existing local exchanges would retain their identities but would share a common electronic interface, whereby they could combine their order flows from the largest companies. There are few details on this system yet, but more information should be forthcoming soon.

The Bourse de Montréal will become the fifth member of, and use the same automated trading system as, the Globex Alliance. The other Globex members are the Chicago Mercantile Exchange (CME), the Paris bourse, the Singapore International Monetary Exchange (SIMEX), and Brazil's Bolsa de Mercardorias & Futuros (BM&F). Bourse de Montréal members will be able to trade the derivative products of the other exchanges of the Alliance through an electronic trading system. Similarly, members of the other exchanges will be able to trade Bourse de Montréal products from the same terminal they currently use to execute trades on their own exchange. This not only helps the member exchanges to become a global exchange with respect to their offering of products, but it also enables them to expand the market for their own products. As well, it allows the member exchanges to share in the high cost of developing and maintaining new technologies, which is necessary if they are to compete with alternative electronic trading systems. Globex spans all three of the world's major time zones. It is also the first integrated, continental market of exchanges in the Americas (Bourse de Montréal, CME, and BM&F).

As another example of alliance initiatives, the NYSE, the Deutsche Boerse, and the Tokyo Stock Exchange are set to announce with Standard & Poor's the first global stock index to be traded on several exchanges. The new index is expected to be a capitalization-weighted benchmark

composed of 100 stocks from the United States, Japan, Canada, Australia, South Korea, and others. It will offer individual investors around the world the opportunity to invest quickly and cheaply in a basket of global stocks.

5. Operating Services: Custody, Clearing, and Settlement

The discussion thus far has focused on activities that occur at the front end of the transaction chain: listing, information dissemination, order routing, and order execution. This section is concerned with the so-called back-office activities and other operating services through which the ultimate transfer of securities is accomplished (e.g., matching, clearing, settlement, custody, and other administrative services). The same forces that have been driving structural change in the financial services sector, broadly defined—technological advances, changing investor demographics, and globalization of the marketplace—have had a pronounced effect on the evolution of operating services. In addition to these environmental forces, formal mergers and other linkages between other financial service providers, as well as between markets and exchanges, have also had an effect on operating services businesses, in part through changes in the volume of transactions that must be processed externally.[11] The combined effect of these various forces has been a substantial degree of consolidation of the sector as less-efficient or otherwise-disadvantaged providers have exited the business.[12]

5.1 Forces encouraging consolidation in operating services

Some of the forces creating pressure for change in the operating services business (e.g., technology and globalization) are pervasive and are affecting the provision of operating services across a number of jurisdictions, while others tend to be confined to particular jurisdictions. Furthermore, the initial conditions vary, which helps to partly account for disparities in the developments in this sector across regions. For instance, consolidation among clearing and

11. After a merger, payments between the merged counterparts become internal to the consolidated institution.

12. Changes in environmental factors can affect payments systems in a number of ways. To illustrate this point, researchers have defined the concepts of "technical efficiency" and "allocative efficiency" as benchmarks. Payments are said to be efficient if they lie on a frontier that minimizes costs for a given overall level of risk and minimizes risk for a given overall level of costs. Allocative efficiency exists when the point chosen on this frontier trades off risks and costs at the socially appropriate relative price. Environmental factors can affect the relationship between payments-system risks and costs in three ways: (i) move the risk-cost frontier, (ii) affect the distance from the frontier (which may increase or decrease technical efficiency), or (iii) change the relative prices for payments services (which may increase or decrease allocative efficiency). For a complete discussion of these concepts, see Berger, Hancock, and Marquardt (1996).

settlement firms has progressed further in the United States than in Europe. However, as expected, the single currency has spurred increased cross-border trading in the euro zone, and with the increased cross-border activity have come growing pressures by institutional investors and broker-dealers for a means of cutting the cost and complexity of completing cross-border equity trades. High transaction fees for clearing and settling cross-border trades (by some accounts, 10 to 15 times higher than for comparable domestic transactions) are the main cost component. There are roughly 30 clearing and settlement systems in Europe, compared with just 2 in the United States, with varying settlement cycles (e.g., monthly rolling settlement in Paris versus T+5 in London). For broker-dealers, maintaining a diversity of settlement systems is expensive. Thus, not surprisingly, many experts argue that pressures to rationalize the payments infrastructures in the euro zone will inevitably lead to further consolidation of European settlement companies and securities depositories. Some observers further contend that the process will not stop there. They suggest that the trading in "blue chip" stocks, especially shares of the top 500 or so companies, will ultimately gravitate toward a single, shared global platform, with trading accessible 24 hours a day, seven days a week. In response, clearing and settlement will necessarily move closer to real time. Among the main drivers of these changes is technology.

5.1.1 Technological advances

Technology, namely advances in the speed and quality of telecommunications, computers, and information services, has had direct and indirect effects on operating services businesses. Direct effects of technology include:

- **Economies of scale.** Many operating services (e.g., custody, cash management, back-office services) entail high costs to build and maintain the necessary technological infrastructure but provide low margins, given the increasingly demanding requirements of institutional clients for more sophisticated services at lower prices. Success requires a continuing ability to achieve lower costs and provide value-added information services to clients (see Table 2). Competitive advantage in this area is largely determined by the scale of a provider's operations, especially as regards market share. A large firm size helps to counterbalance competitive pressures and provides the wherewithal for the continuous technology upgrades necessary to achieve any unit cost advantage in pricing services that are basically commodity products. Providers of these services often pursue mergers and acquisitions as a means of spreading the high set-up costs of new technological infrastructure over a larger customer base, thereby lowering unit costs.
- **Feasibility of remote processing.** Modern information and telecommunications technologies make it possible to conduct activities that don't require proximity to the client in remote locations to take advantage of lower labour or real estate costs. Accordingly, back-office operations can be physically separated from the front end with no loss of service quality. There is also the potential for significant cost improvement if such activities are outsourced to banks

that benefit from economies of scale.[13] This appears to be occurring already at the international level, where a considerable degree of specialization is taking place, resulting in the concentration of correspondent banking and custody services in a small number of global providers.[14]

- **Enhanced payments processing and settlement alternatives.** As a result of the increased speed and lower costs of computing and telecommunications equipment, financial service providers can, with the appropriate technology infrastructure, centralize payments and settlement systems. For example, large international banks now tend to concentrate most of their worldwide payment activities in one (or a few) processing centre(s). The trend among the global investment banks is to seek to concentrate liquidity in one place and to cut the cost and complexity of clearing and settling. The cost savings realized through such internal reorganization can be substantial, in some cases sufficiently large that internal consolidation becomes a viable alternative to outsourcing.[15]

Advances in information and telecommunications technology, along with the Internet and increased broadband connectivity, have affected the payments and securities-settlement industry indirectly by helping to facilitate the establishment of new systems to route, execute, and monitor trades. The surge in on-line trading volume from institutional and retail investors, and the increase in direct electronic cross-border trading, have put pressure on existing settlement systems. The pressures on settlement infrastructures are likely to be further exacerbated over the next few years as initiatives to drastically shorten the settlement timetable come on line and as trading hours extend further.

5.1.2 Demographics and changes in investor behaviour

Individuals are living longer, healthier lives, resulting in longer periods spent in retirement and creating a need for additional savings to fund them. In many countries, the need for retirement

---

13. Historically, in many OECD countries, such activities have been outsourced to institutions in the same sector as the client bank. However, recent years have witnessed the emergence of "transaction banks" that specialize in the provision of payment or back-office services to other banks. In some cases, these service providers are non-bank entities.
14. The term correspondent banking refers to an arrangement whereby one bank (the correspondent) provides payment and other services to a client bank, especially across national boundaries. Europe is a special case, where the euro has reduced substantially the number of correspondent relationships needed to operate in the euro zone. This development has accelerated the trend towards concentration of the correspondent banking and custody businesses, characterized by a shift of business from indigenous subcustodians to more established global providers.
15. A frequently cited example from the public sector is the Federal Reserve's consolidation of the IT platforms that supported Fedwire operations from 36 sites into the one main site with 2 backup sites. The change enabled the Federal Reserve to eliminate redundant resources and reduce operating costs, leading to dramatic reductions in Fedwire fees over a three-year period of roughly 50 per cent for funds transfers and 25 per cent for securities transfers. These same sorts of savings may carry over to consolidation of private sector processors.

income has prompted growth of private pension plans as alternatives to state-sponsored, pay-as-you-go systems, resulting in a rising demand for "retirement products" such as mutual funds.[16]

As part of the institutionalization of wealth occurring throughout the OECD area, institutional investors increasingly hold and trade global portfolios on behalf of retail and corporate clients. In fulfilling their mandates, institutional investors have sought to diversify their trading through different markets and alternative trading facilities in the search for optimum combinations of transactions costs, liquidity, and price discovery. For example, mutual fund families in the United States and elsewhere have begun to compete for funds under management by slashing fees, while they themselves have sought lower transactions costs in carrying out their own trading activities. Their efforts to reduce trading costs have contributed to disintermediation of traditional service providers. In turn, larger intermediaries have themselves become large institutional investors as their proprietary trading activities have increased. Thus, despite different underlying needs (see Table 3), the actions of institutional investors and their service providers have exerted similar pressure on the settlement system, resulting in increasing levels of cross-border trading, creating competition among existing exchanges, and encouraging the growth of alternative trading systems and ECNs. The move by exchanges to forge alliances or mergers is, in part, a reflection of the increased pressures on them to reduce costs and to improve liquidity. Much of this cost reduction is occurring at the clearing and settlement level, where some participants contend the largest cost synergies lie.

5.1.3 Globalization

These developments are becoming increasingly global. In response to increased competition, cross-border strategic alliances have increased both between firms and market infrastructures. This process is evident in virtually all industries, with large numbers of international alliances and joint ventures as well as full-scale mergers and acquisitions. Over the past decade or so, economies have become much more interconnected, as governments around the globe have opened up their markets to international participation and have reconsidered the legal and regulatory frameworks in which financial institutions operate. Non-financial companies that operate globally expect financial intermediaries to provide products and services attuned to the international nature of their operations. Today, global financial products are available in national markets, and domestic investors operate increasingly in global markets. Competitive pressures are such that wholesale service providers have been driven to establish a presence in each of the major international financial

16. In addition to record inflows to mutual funds, there has also been a surge in self-directed investments by individuals for retirement purposes, as reflected in the explosion of Internet-based trading.

centres. Service providers, in turn, have generated special requirements for payments and securities-settlement systems, as reflected in their requests for direct remote access[17] and a global collateral pool.[18] Global providers normally participate in several systems and, thus, are generally in favour of a high degree of standardization across systems. Their demands for harmonization of systems may encompass technical aspects of payments processing such as message formats, as well as support for global cash management, delivery versus payment procedures, and professional information systems.

5.1.4 Financial sector consolidation

Financial sector consolidation led to the emergence of large market players. In so doing, consolidation can affect the way in which payments and securities-settlement activities are conducted and the resources that are needed to provide those services. This issue has been the subject of a growing body of research.[19] One conclusion is that by reducing the number of market participants, consolidation can increase the efficiency of payment and settlement activities. When one bank is merged into another, payments between the institutions or between their customers can be processed internally and need not be passed on to the interbank system. Thus, even if there is no actual increase in the proficiency of the merged entities to process transactions, overall system efficiency might still increase with a decline in the volume of payments or securities transfers to be processed. A reduction in the number of participants might also contribute to greater system efficiency if the remaining banks are better able to agree on common technical standards and market conventions.[20]

Similarly, consolidation might lead to increased efficiency if payment and settlement activity shifts to more-efficient payments processors—for example, by enabling larger service providers to form more-efficient payments networks. Larger banks would have two main advantages over their smaller competitors with regard to the efficient provision of settlement services for payments and securities. First, they typically have the financial strength to invest in new, sometimes costly,

---

17. Direct remote access to an interbank funds-transfer system refers to the ability of a credit institution in one country to become a direct participant in an established payments system in another country ("host country"), and thereby to have a settlement account in its own name with the central bank (or other settlement agent) in the host country without necessarily having established a branch in the host country.
18. A global collateral pool would contain collateral denominated in several currencies that would be accepted by several central banks to collateralize intraday and/or overnight credit provided to eligible counterparties.
19. See the review by Berger, Demsetz, and Strahan (1999). See also Hancock and Humphrey (1997), and the Group of Ten (2001).
20. See Humphrey, Pulley, and Vesala (1996).

technologies that might increase efficiency and reduce risk in payments and securities settlement. Second, they may be able to capture economies of scale.

5.2 Consolidation of market infrastructures

With the advent of electronic trading, financial firms now have a wider range of alternatives for executing transactions and performing support functions. Under pressure from global market players, operating service providers face the need to enhance market infrastructures on an ongoing basis. These pressures have not been limited to institutions. Market infrastructures have also faced increased competition and the search for lower costs and increased efficiency has sparked a round of consolidation. Linkages are being established both at the horizontal and at the vertical level, where the latter describes the process of integrating different activities taking place in the transaction chain (e.g., in the securities industry, the integration of trading, clearing, settlement, and custody services within a single institution).[21] The consolidation of securities settlement in the United States has been characterized by both horizontal and vertical consolidation. First, the Depository Trust Company (DTC), already the largest securities depository in the United States, merged with two regional depositories (the Midwest Securities Trust Company and the Philadelphia Depository Trust Company) to create a single central securities depository (CSD). Second, in 1999, DTC and the National Securities Clearing Corp. (NSCC), which compares and nets almost all broker-to-broker corporate and municipal securities trades in the United States, affiliated their organizations under a common holding company—the Depository Trust & Clearing Corp. (DTCC).

In Europe, the consolidation of the securities settlement industry has proceeded at a slower pace than in the United States, although the pace has accelerated since the introduction of the euro. Consolidation is taking place partly through the merger of CSDs that operate securities-settlement systems.[22] For example, in January 2000 the owners of Cedel, the Luxembourg-based international central securities depository (ICSD), and the owners of Deutsche Börse Clearing, the German CSD, set up a new holding company called Clearstream International, which owns both depository institutions. The constituent entities remain legally separate but use a common technical infrastructure. In March 2000, the boards of Euroclear, the Belgium-based ICSD, and Sicovam, the French CSD, announced their agreement in principle to fully merge their two

21. For example, most European exchanges offer an integrated dealing, clearing, and settlement service.
22. There are notable exceptions, however. For example, the proposed merger between the London Stock Exchange and the Deutsche Börse did not include the two settlement companies: Crest in London and Clearstream in Frankfurt. Rather, the basic aim of the combination was to consolidate the front end through a common trading platform.

organizations. Most observers expect to see further centralization of securities depositories going forward.

6. Issues

To recap, the impact of technology depends on whether the market is matching or intermediated. In a low-technology world, minimization of search costs would imply an exchange that physically brings traders together and lets them match each other using their voices. High technology means that computer systems can quietly do the matching, vastly reducing the marginal search costs to essentially zero. The essence of an intermediated market is that the market-makers carry an inventory. Technology may allow inventories to become closer to a just-in-time inventory, but it still carries a cost that must be recouped in the bid-ask spread. The net effect would seem to be that technology favours a matching market more than an intermediated market. It would seem that, over time, highly liquid products would migrate to matching markets, there would be a trend to commoditize less-liquid products, and matching exchanges would go global (via alliances) to the degree possible. The end result would be one global, 24-hours-a-day, matching market in the most-liquid financial products. Moreover, the forces of competition would generate a continuing commoditization of less-liquid financial products (ABSs are an example.)

What does this mean for intermediated markets? There will always be less-liquid markets, and there will be scope for market-makers to provide liquidity to those markets. Moreover, they will have a significant incentive to be on the cutting edge of developing new, customized, innovative products, such as exotic derivative products. The intermediated sector would likely have two elements: a global element that would specialize in new, innovative products, and national or regional elements that would intermediate the trades of many highly specialized products (off-the-run bonds and small-cap stocks), which would be of interest primarily to local (national) participants. The end result would be a highly liquid global matching market, and national intermediated markets.

Global developments seem to point to greater tiering of markets. For example, financial market evolution appears to be pointing in the direction of a single, large global matching market for the most global and liquid securities, based on linkages between regional and national stock markets. This market, which would be operational 24 hours a day, would involve the electronic matching of buyers and sellers. This market would handle large-cap stocks and standardized debt obligations and derivatives. It would be a virtual market composed of the participants in many trading centres around the globe. Thus, there would be only limited relocation of portions of trading centres. In addition, there would be a global intermediated market in highly specialized derivative products.

The market-makers in this market would have a strong incentive to continue to develop new and innovative products to maintain their market niche. Moreover, at a regional or national level there would continue to be scope for intermediated markets to trade less-liquid securities that would largely be of local interest, such as off-the-run bonds, less-well-known corporate obligations, and small-cap stocks (although indices of the latter in particular may be internationally traded). However, the more-liquid products may gravitate toward the "global" market, leading to a shrinkage of this sector.

Although, for heuristic reasons, this view is presented in a static sense, it is probably true that a steady-state view of the world is obsolete, or at least hazardous. Even if financial markets resembled what is described above for a time, the entire structure is likely to be contestable, and very likely to give way at some point to something different. One of the few certainties of the future is that it is bound to be at least as dynamic as the present. The world outlined above is likely to be but a waypoint along the road to something truly unimaginable.

The preceding discussion has described where financial markets are now and the forces that are influencing their development, and has given some indication of where they could be going. However, a number of important questions remain to be answered, including: What do these changes imply for the efficiency, stability, and safety of financial markets? What are the implications for the future viability of national financial markets? What are the risks? Are there any policy recommendations, and if so, what are they? This section briefly addresses these questions.

6.1 The efficiency, stability, and safety of future financial markets

The overwhelming feature of a global matching market would be enormous liquidity—in fact, the maximum possible. This has many implications.

Efficiency has two meanings. In finance, it refers to markets reflecting fundamental news rapidly in prices. For economists, it refers to the resources required to fulfill a function. Massive and continuous liquidity would result in prices instantaneously reflecting fundamental information, much as the more-liquid markets do today. Moreover, the advent of a single global market would ensure that duplication of effort would be at a minimum. Thus, this market structure would appear to be consistent with efficiency. However, there could be inefficiencies in the less-liquid local markets. Furthermore, these inefficiencies could be heightened if the more-liquid products traded in these local markets are lost to the global market.

The concept of stability includes volatility, contagion, and overshooting. Higher liquidity will, in itself, reduce volatility, because single large idiosyncratic trades will have less effect on the market. In exchanges, the depth of the order book and the speed of arrival of new limit orders that replace limit orders that have been consumed by large market orders mitigate volatility. Many market-makers act with notional order books; the depth and resilience of their order books is an important element in determining when and if there is any disruption of their market-making function in the face of a negative shock. However, short-term volatility during relatively normal times is not the major concern.

In terms of contagion, there does seem to be evidence that asset prices are becoming more interrelated.[23] With global financial markets, market dynamics are global in scope. However, this is already a fact of life, and further developments along these lines may not have a major impact. The concern is, of course, that the failure of a market or of a payments and settlement system could have severe impacts elsewhere. Clearly, the consolidation of institutional investors and other financial market participants leads to a smaller number of participants having a greater impact on market dynamics. Moreover, it has been suggested that increasing transparency could lead market participants to emulate the behaviour of major players, leading to greater herding behaviour.

Finally, although the structure of markets will undoubtedly change, the fundamental manner in which participants behave is unlikely to change, so overshooting and undershooting, to the degree that they exist, are likely to continue.

The safety and soundness of the global market will, obviously, be of great importance, and there appear to be two possible approaches in this regard. The first would be to set up an international superregulator with powers to set standards for the market infrastructure, oversee all international financial markets, and enforce discipline as appropriate. Such an institution should hold as a core principle that reliance on internal governance and market discipline is central, with minimal invasiveness. Of course, the question is what such an institution should do in the event of a global financial crisis: respond on its own (and if so, how), recommend responses by central banks and perhaps the IMF, or nothing, and there are moral hazard considerations as well.[24] The second approach would be continued reliance on existing regulators and institutions, with some incremental modifications. The chief advantage of the first approach is that comprehensive regulation of all aspects of global markets could be internalized within a single institution. The

23. See, for example, BIS (2000).
24. Given the size and importance of global financial markets, moral hazard will be a problem regardless of the particular regulatory institution arrangements.

chief difficulty of the first approach would be to generate sufficient international political consensus for many national governments to cede sufficient sovereignty to forge such an institution.[25] A pessimistic pragmatist might well see the second approach as being more fruitful within a reasonable time frame.[26] However, the second approach smacks of a piecemeal structure, and the health of global financial markets is too important to be left to second-best structures.

6.2 The viability of national financial markets

From the viewpoint of a small open economy, there are three possible reasons for concern about the future viability of national financial markets: (i) access of domestic investors to global capital markets, (ii) the continued access of domestic issuers to reasonably priced capital, and (iii) the employment and other spin-off benefits of having a developed domestic trading centre. The first of these concerns is perhaps the easiest to address. If the global market develops as a result of interlinkage of domestic markets, then domestic investors would enjoy direct access to global markets. Perhaps the second concern is the most difficult to address. Particularly for smaller countries, a domestic intermediated debt and small-cap stock market may not be at a sufficient scale to afford a competitive market. Lack of reasonably priced capital, particularly for small and medium-sized firms, could slow economic growth from what would be potentially possible. This would be a serious problem. (Although one could suggest that the banking system could fill this gap, the banking industry is under some of the same pressures mentioned above, and it is conceivable that that sector could face a scenario similar to the one faced by financial markets.) In this event, domestic authorities would be faced with the possible choice of not allowing the necessary consolidation in the first place, to institute a regulated monopoly (both very heavy-handed approaches), or to deem the markets to be sufficiently contestable to mitigate the inefficiencies caused by monopolistic pricing. The final potential problem is the loss of employment if a portion of the financial sector relocates in a global financial centre.[27] However, this is not entirely negative. The loss of employment that is related to new-found efficiencies in the financial sector is positive. With less societal effort devoted to the financial sector, resources are freed up for other productive uses.[28] However, it is often difficult to disentangle job losses

25. It has also been suggested that banking supervision is sufficiently micro-oriented that international supervision would effectively be unmanageable, although banking supervision is not quite the same as financial market regulation.
26. White (2000) is clearly in this camp.
27. While it appears to us that the single global market will be a virtual market composed of many geographically separate trading centres, some critics believe that the idea of a single market must necessarily lead to a single trading centre. We believe that a significant relocation of major trading centres is unlikely, and in this section our assumption is that relocation is minimal.
28. Obviously, however, there are adjustment costs.

caused by relocation from those caused by new-found efficiencies. Moreover, the fact of international boundaries makes it unlikely that the winners in these adjustments will ever directly compensate the losers. It is likely that the only way for a small country to retain a portion of the global market would be if agents in that small country were to find a niche in which they could offer exemplary service.[29]

6.3 Effects of consolidating clearing and settlement[30]

Financial sector consolidation raises a number of issues for policy-makers, given its potential effects on competition and risk in payments and settlements infrastructures. There are many different effects, some of which pull in opposite directions, so it is difficult to state definitively whether the net effect is positive or negative. Consider, for example, the implications of consolidation for competition. As stated earlier, the consolidation of financial institutions affects the number of participants in payments and securities-settlement systems, and thereby the volume of flows in those systems. There is the potential that the concentration of payment and settlement flows within fewer institutions will increase the efficiency of payment and settlement activities, which is a positive effect. However, under normal market conditions, operating services and payment and settlement activities tend to be low-margin businesses, which generally require high volumes to generate adequate returns. Thus, should processing volumes on payment and settlement systems decline too much as a result of consolidation among system participants, processing fees might have to be increased to ensure that revenues are sufficient to cover the high set-up and maintenance costs of infrastructures.

Consolidation in recent years has occurred not only among financial institutions, but has also involved market infrastructures. There is the potential, at least, that such a reduction in payment and settlement infrastructures will result in reduced competition, which could have a negative effect on fees charged for settlement services and possibly reduce incentives for innovation on the part of service providers.

---

29. For instance: Ireland has a relatively cheap, skilled labour force, and a favourable tax environment. In an age of almost instantaneous communication, what reason is there not to have all of an international firm's back-office activities concentrated in Ireland? Why not then contract out to an Irish firm that handles the back-office computer work for any number of other financial institutions? Technology has seemed to open the door to more regional specialization in some sectors of the financial services industry.

30. See the discussion in Group of Ten (2001), available at: www.bis.org/publ/gten05.htm, or www.oecd.org/eco/Group-of-Ten/report-on-consolidation.htm.

To assess the relative weights of these various effects is difficult. For one, the process is dynamic. Effects that occur in the short run may not prevail over the longer term.[31] Moreover, there may be differences in the effects across different segments of the business (e.g., retail versus wholesale services). In the case of wholesale services, many participants in large markets have argued that factors such as the existence of economies of scale, increased use of book-entry registration of securities, and the economic benefits of netting favour a high degree of consolidation. A few participants have even suggested that a monopoly provider would be the preferred arrangement in some service areas (e.g., securities settlement). Others contend that some measure of competition via competing systems would be preferable to a single provider, but there should be linkages between the systems to preserve the benefits of a more integrated infrastructure.

In the case of retail payments, the net effect of consolidation on competition is difficult to establish because the behaviour of individual institutions may offset the effects of consolidation of service infrastructures and vice versa. In general, whether positive or negative effects dominate depends on the overall market infrastructure, whether consolidation occurs among individual financial institutions or market infrastructures, the definition of the relevant market (e.g., local, national, regional, or global), and the existence of any entry barriers (e.g., high switching costs or compliance costs).

The implications of consolidation for risks arising in payments and securities-settlement activities are also complex. To the extent that more-efficient institutions acquire less-efficient institutions, consolidation among financial institutions can result in improvements in risk management. By the same token, as consolidation concentrates payment flows among fewer participants, there is a greater likelihood that offsetting payments will arise, which could reduce liquidity risk. However, the concentration of settlement flows among fewer participants also has the potential to cause significant liquidity problems for counterparties expecting payments, and could have systemic risk consequences should a large payments processor encounter difficulties that preclude it from processing payment orders. The move toward third-party service providers and the increasing number of multinational institutions that have access to several payments and securities-settlement systems in different countries also have implications for financial risk and give rise to potential contagion effects.

---

31. A study by Hancock, Humphrey, and Wilcox (1999) found that, taking into account scale economies and declining costs of technology, substantial scale economies existed in Fedwire operations and that consolidation resulted in improvements in cost efficiency in the long run, but there were significant transition costs.

6.4 Policy recommendations

The developments described above are very positive to the world economy and especially to the economies of the OECD area. Therefore, the first policy recommendation would be to not impede developments that improve the efficiency or stability of the markets.[32] Any policy proposals that go against the wishes of the vast majority of investors or other market participants are unlikely to improve the efficiency or stability of financial markets, and they are likely to move to more advantageous jurisdictions in any event.

Naturally, the loss of the more-liquid elements of a nation's financial markets will be sorely felt by that country. Not only are the highly remunerated jobs and tax revenues lost directly, but the demand for specialized services dries up, leading to higher costs for the residual market.

The move toward global efficiency may be complicated by national borders. The main beneficiaries will be the receiving countries, and those experiencing most of the costs will be the smaller countries losing portions of their financial centres. If there is no diminution of services offered and costs are cut, financial markets will become more efficient globally and all users of financial services will experience a net gain. However, on an international scale, there are few opportunities for the winners to compensate the losers. This could encourage countries at risk to consider policies to hamper these developments, but ultimately such policies will only create growing distortions and are doomed in the long run.[33]

The key risk, therefore, is that the economically efficient scale of the remaining residual national intermediated markets would potentially allow the exercise of monopoly power. Since the correct policy recommendation depends upon the costs and benefits of the various options that are available, and these vary on a case-by-case basis, it may be hazardous to make a single, blanket recommendation. However, it is recommended that regulatory authorities remember that residual intermediated markets are likely to remain contestable, and more heavy-handed intervention may neither be necessary nor desirable.

National-level regulatory bodies should support the appropriate, comprehensive international regulation of global financial markets, whether through an international superregulator or through

---

32. Clearly, there are important issues related to how the global market would be set up, the nature of the linkages, how it would support liquidity, anonymity, transparency, how it would be regulated, and most of all, how its safety and soundness would be ensured. Although very important, these issues are beyond the scope of this study.

33. Moreover, heavy-handed policies could encourage relocation, and could thus be entirely self-defeating. It may be preferable to create a policy environment that is very supportive of the trading centre(s).

the evolution of existing structures. National regulatory bodies should also seek to ensure an appropriate level of transparency in markets and redundancy in the networks, to support the efficiency and resiliency of markets. Finally, and perhaps most importantly, the development of efficient and robust markets that participants are comfortable with is paramount, as increased trading leads to the positive externality of greater market liquidity, and hence stability.

Any outstanding issues regarding clearing and settlement fall under the purview of central banks and competition authorities. They include questions concerning remote access, third-party specialists (especially non-bank service providers), the establishment of a global collateral pool, and the move toward monopoly providers.

7. Conclusions

This study has reviewed the structure of financial markets in the OECD area and the forces acting upon them. The results of the study suggest that the direction of change is towards a single global market through the interlinkage of national equity markets. Domestic intermediated markets would be undermined by this development, since the standardized products traded on those markets could be traded more efficiently and at lower cost on the global matching market. The domestic intermediated market would continue to exist, since there will always be relatively illiquid products and agents desiring to trade them. However, the scale of the remaining national market may not be sufficient to allow for a competitive market. Authorities, particularly in smaller countries, should be aware of this possibility.

Overall, however, these developments are very positive from the standpoint of the global economy. Governments should embrace these changes and should ensure the development of an efficient, stable, and safe global financial market.

References

Berger, A.N., D. Hancock, and J. Marquardt. 1996. "A Framework for Analyzing Efficiency, Risks, Costs, and Innovations in the Payments System." Presented at *Payment Systems Research & Public Policy Risk, Efficiency and Innovation*. Federal Reserve Conference held 7–8 December 1995. *Journal of Money, Credit and Banking* 28: No. 4, Part 2, 696–732.

Berger, A.N., R.S. Demsetz, and P.E. Strahan. 1999. "The Consolidation of the Financial Services Industry: Causes, Consequences, and the Implications for the Future." *Journal of Banking and Finance* 23: 135–94.

BIS. 2000. *International Financial Markets and the Implications for Monetary and Financial Stability*. BIS Conference Paper No. 8. Basel.

Group of Ten. 2001. *Report on Consolidation in the Financial Sector*. Basel. <URL: http://www.bis.org/publ/gten05.htm>, or <URL: http://www.oecd.org/eco/Group-of-Ten/report-on-consolidation.htm>

Hancock, D. and D.B. Humphrey. 1997. "Payment Transactions, Instruments, and Systems: A Survey." *Journal of Banking and Finance* 21: 1573–1624.

Hancock, D., D.B. Humphrey, and J.A. Wilcox. 1999. "Cost Reductions in Electronic Payments: The Roles of Consolidation, Economies of Scale, and Technical Change." *Journal of Banking and Finance* 23: 391–421.

Humphrey, D.B., L.B. Pulley, and J.M. Vesala. 1996. "Cash, Paper and Electronic Payments: A Cross-Country Analysis." Presented at *Payment Systems Research & Public Policy Risk, Efficiency and Innovation*. Federal Reserve Conference held 7–8 December 1995. *Journal of Money, Credit and Banking* 28: No. 4, Part 2, 914–39.

Lee, R. 1998. *What is an Exchange?* Oxford: Oxford University Press.

White, W. 2000. "What Have We Learned from Recent Financial Crises and Policy Responses?" BIS Working Paper No. 84. Basel.

Yang, J. 2000. "Price Efficiency and Inventory Control in Two Interdealer Markets." Bank of Canada. Photocopy.

Table 1: Share of ECNs in NASDAQ Trading Volume, July 2000

ATS	% of trades	% of share volume	% of dollar volume
Archipelago	1.2	1.0	1.1
Attain	0.0	0.0	0.0
B-Trade	1.6	1.5	1.6
Brut	2.1	1.5	1.5
Instinet	10.5	11.8	14.3
Island	11.6	5.8	8.5
NexTrade	0.0	0.0	0.0
Redi-Book	3.6	2.8	3.3
ATS Total	30.6	24.4	30.3

Source: http://www.marketdata.nasdaq.com

Table 2: Custodian bank services

Service category	Type of service	Activities included
Basic	Safekeeping	Looking after entitlements, in paper or electronic form
	Settlement	Ensuring that buyers receive the securities purchased and sellers receive money owed. In most markets, the actual exchange of cash for securities takes place by electronic delivery versus payment in commercial or central bank money within a national or international central securities depository, to which custodians may be the sole means of access for non-bank participants
	Income collection	Ensuring that dividends and interest payments on holdings of shares and fixed-income securities are collected and paid to investors
	Reporting	Delivering regular reports to institutional investors on their securities transactions and portfolios
Banking	Foreign exchange	Processing payments and receipts in foreign currencies
	Cash management	Reinvesting the surplus cash of clients by placing it on deposit or by investing it in a proprietary or third-party money market fund
Asset servicing	Corporate actions	Receiving notification of corporate actions like rights issues or takeovers from registrars and passing it along to investors. Taking responsibility for acting upon the instructions issued by clients
	Proxy voting	Exercising voting rights on behalf of investors
	Tax reclaims	Reclaiming withholding taxes from national tax authorities on behalf of fund managers under double taxation treaties
Value added	Securities lending	Managing the lending for profit of the securities held in the portfolios of investors, usually to broker-dealers needing the securities to cover short positions or for general collateral purposes
	Performance measurement	Reporting to investors on the performance of their portfolio against relevant benchmarks
	Fund administration	Providing valuation and other administrative services to investors who have funds domiciled in offshore locations

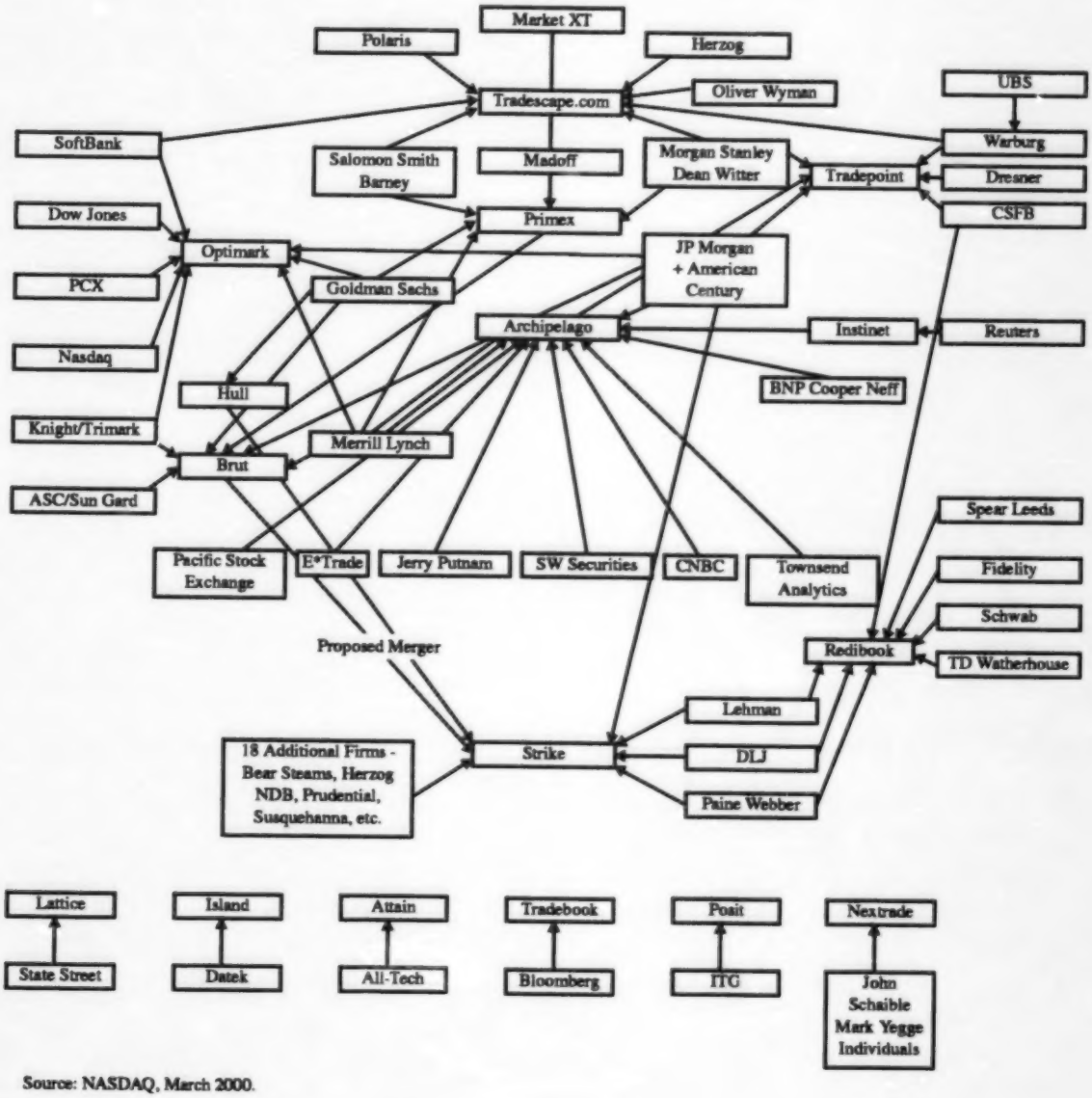
Source: *Financial Times* survey, July 2000.

Table 3: The needs of financial intermediaries

	Fund managers	Broker-dealers	Global custodians
Trading	Maximum liquidity	Low-cost execution Arbitrage between cash and derivatives markets	Rapid communication of transactions
Confirmation	Electronic confirmation of trade	Electronic confirmation of trade	Straight-through processing
Clearing		Anonymity Known counterparty risk Minimum margin needs	
Settlement	Contractual settlement	Settlement efficiency Same-day turnaround Low settlement fees	Low settlement fees
Financing		Financing Optimal collateral usage	Yield-enhancing services
Custody	Enhanced custody (core + contractual income services)	Low-cost core custody (basic + tax and market claims)	Low-cost basic custody (safekeeping, payment distributions, corporate actions)

Source: Euroclear, "The Hub and Spokes Clearance and Settlement Model: The Pan-European Settlement Solution for Efficient and Competitive Capital Markets." May 1999.

Figure 1: Electronic Trading Landscape—Ownership



Source: NASDAQ, March 2000.

Bank of Canada Working Papers
Documents de travail de la Banque du Canada

Working papers are generally published in the language of the author, with an abstract in both official languages. ***Les documents de travail sont publiés généralement dans la langue utilisée par les auteurs; ils sont cependant précédés d'un résumé bilingue.***

2001

2001-9	Testing for a Structural Break in the Volatility of Real GDP Growth in Canada	A. Debs
2001-8	How Rigid Are Nominal-Wage Rates?	A. Crawford
2001-7	Downward Nominal-Wage Rigidity: Micro Evidence from Tobit Models	A. Crawford and G. Wright
2001-6	The Zero Bound on Nominal Interest Rates: How Important Is It?	D. Amirault and B. O'Reilly
2001-5	Reactions of Canadian Interest Rates to Macroeconomic Announcements: Implications for Monetary Policy Transparency	T. Gravelle and R. Moessner
2001-4	On the Nature and the Stability of the Canadian Phillips Curve	M. Kichian
2001-3	On Commodity-Sensitive Currencies and Inflation Targeting	K. Clinton
2001-2	Exact Non-Parametric Tests for a Random Walk with Unknown Drift under Conditional Heteroscedasticity	R. Luger
2001-1	The Elements of the Global Network for Large-Value Funds Transfers	J.F. Dingle

2000

2000-23	The Application of Artificial Neural Networks to Exchange Rate Forecasting: The Role of Market Microstructure Variables	N. Gradojevic and J. Yang
2000-22	Une analyse empirique du lien entre la productivité et le taux de change réel Canada-É-U	D. Dupuis et D. Tessier
2000-21	Les effets réels du cours des actions sur la consommation	L. Pichette
2000-20	Steps in Applying Extreme Value Theory to Finance: A Review	Y. Bensalah
2000-19	Le modèle USM d'analyse et de projection de l'économie américaine	R. Lalonde
2000-18	Inflation and the Tax System in Canada: An Exploratory Partial-Equilibrium Analysis	B. O'Reilly and M. Levac
2000-17	A Practical Guide to Swap Curve Construction	U. Ron

Copies and a complete list of working papers are available from:
Pour obtenir des exemplaires et une liste complète des documents de travail, prière de s'adresser à :

Publications Distribution, Bank of Canada
234 Wellington Street, Ottawa, Ontario K1A 0G9
E-mail: publications@bankofcanada.ca
Web site: http://www.bankofcanada.ca

Diffusion des publications, Banque du Canada
234, rue Wellington, Ottawa (Ontario) K1A 0G9
Adresse électronique : publications@banqueducanada.ca
Site Web : http://www.banqueducanada.ca